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AMERICA.—*The Work of the Greely Expedition.*—The geographical work of the Lady Franklin Bay Expedition, according to the account given by Lieut. Greely at the British Association, covers nearly three degrees of latitude and over forty degrees of longitude. Lieut. Lockwood's journey to the north added nearly 100 miles of coast line beyond the farthest point seen by Lieut. Beaumont, of the Royal Navy. There were no indications that the most northern point of Greenland seen, 83° 35′ N. lat., 38° West long., was the northern termination of Greenland. The coast presented numerous fjords, with many outlying islands, and the interior, as seen from an elevation of 2000 feet, consisted of confused masses of eternally snow or ice-clad mountains. The coast-line was high and precipitous, the formation schistose slate with a little quartz. The arctic poppy and several saxifrages were seen, as were also traces of the polar bear, lemming and arctic fox, and a hare and a ptarmigan were killed. A snow bunting was heard. A curious fact was the existence of a "tidal crack" extending from Cape Bryant along the entire coast, stretching across the fjords in a direct line from headland to headland, and varying in width from one yard to several hundreds. Inside the crack was rough hummocky ice, while outside lay the palæocrystic ice. The interior of Grinnell land from the 81st to the 82d parallels, between Kennedy and Robeson channels and the Western Polar ocean, was found entirely free from snow in July, except on the very backbone. Vegetation abounded, willows, saxifrages, grasses and other plants completely covered large tracts of ground. These valleys afford good pasturage for musk cattle which feed toward the sea-coast in the summer and withdraw to the interior toward winter. Raised beaches, marine shells and driftwood indicated the recent elevation of this region above the sea. From the 81st parallel southward to Hayes sound between the heads of Archer and Greely fjords, stretches the perpendicular front of an ice-cap, the average height of which is not less than 150 feet. From the summit of Mount Arthur (4500 feet) a similar ice-cap could be seen north of the Garfield range, with extensive glaciers projecting through each mountain gap. The southern limit of this cap closely coincides with the 82d parallel, and its area must be about 6000 square miles. The line of perpetual snow on Mount Arthur was 3500 feet above the sea, while the crest of Grinnell Land was 2500 above the sea in front of the southern ice-cap, and 3000 feet near Mount Arthur.

GEOLOGY AND PALÆONTOLOGY.

THE STRUCTURE OF THE COLUMELLA AURIS IN CLEPSYDROPS LEPTOCEPHALUS.[1]—The columella auris in *Clepsydrops leptocephalus* Cope, is bifurcate at the proximal extremity. The shorter expanded extremity is the stapes proper. The oblique perforation of its base is a character which has not been hitherto observed in any reptile, not even in the allied form Hatteria (Huxley). If, as is probable, the perforation is homologous with the foramen of the mammalian stapes, we have here another point of resemblance to this class. The longer proximal branch of the columella has only half the width of the stapedial portion, and its long axis makes an obtuse angle with that of the latter. It is perhaps the ossified suprastapedial cartilage of Huxley, which that author states (Anatomy of Vertebrated Animals, p. 77) is not ossified in any of the living Sauropsida. Huxley supposes this cartilage to be the homologue of the incus, and remarks[1] that in a young Mammalian fœtus " it appears exactly as if the incus were the proximal end of the cartilage of the first visceral arch." This identification will require an excessive abbreviation of the stapes in Clepsydrops, and until this is proven I prefer to call this process the *epicolumella* (see Pl. XXXVIII, fig. 2). The columella now described, resembles a rib, of which the epicolumella resembles the head, and the stapes the tubercle. If this process be the incus, the stapes is shortened as in the majority of Mammalia, unless the primitive suture between the two be longitudinal. The form and position of the true stapes give support to the view of Salensky, that it is not part of a true visceral arch, but is developed in the connective tissue surrounding the mandibular artery. We see that in this Pelycosaurian it is not the proximal part of the arch, and surrounds the mandibular artery. The columella is divided into at least two distinct elements. This is clearly indicated by its abrupt truncation distally by a rough sutural surface. If there be but one bone distad to the stapes, it is homologous with the cartilage, which has been shown by Peters[2] to be distinct in Hatteria, crocodiles and various lizards. It is the triangular ligament of Cuvier. If the suprastapedial be incus, this element is malleus; and it is usually identified as such by the older anatomists. In this structure we have evidence that the hypothesis that the articular and quadrate bones are homologous with the ossicula auditus, is incorrect. The Pelycosauria will probably come under the head of " Sauropsides malleoferes " of Albrecht. We have here an approximation to the Mammalia in two points: (1) The perforation and ? shortening of the stapes; (2) and the ossification of the incus, which (3) is distinct from the malleus, thus furnishing homologues of the principal ossicles of the ear. It is unnecessary to observe, however, that this part of the skeleton does not resemble the corresponding part in the known Monotremes.

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[1] Abstract of paper read before the National Academy of Sciences Oct. 16, 1884

EXPLANATION OF PLATE XXXVIII.

(I am indebted to the American Philosophical Society for the use of this plate.)

FIG 1.—*Clepsydrops leptocephalus* Cope, right quadrate bone (Q) with condyle and zygomatic process (*z*) from the right, or external side. *Pt*, pterygoid bone of

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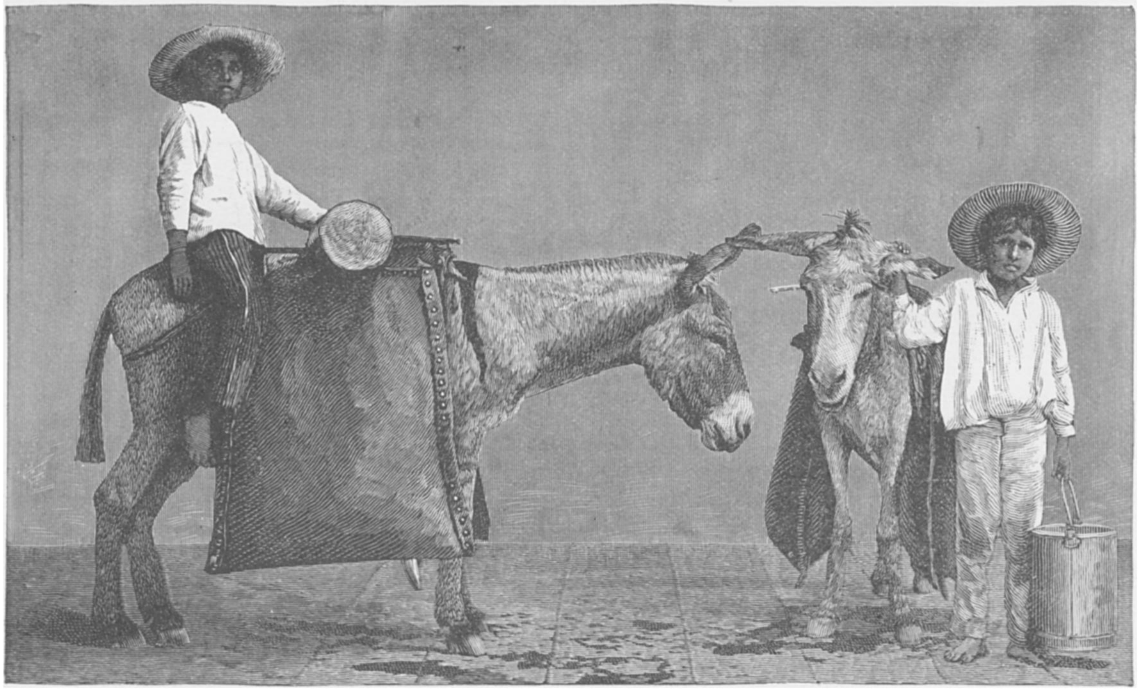
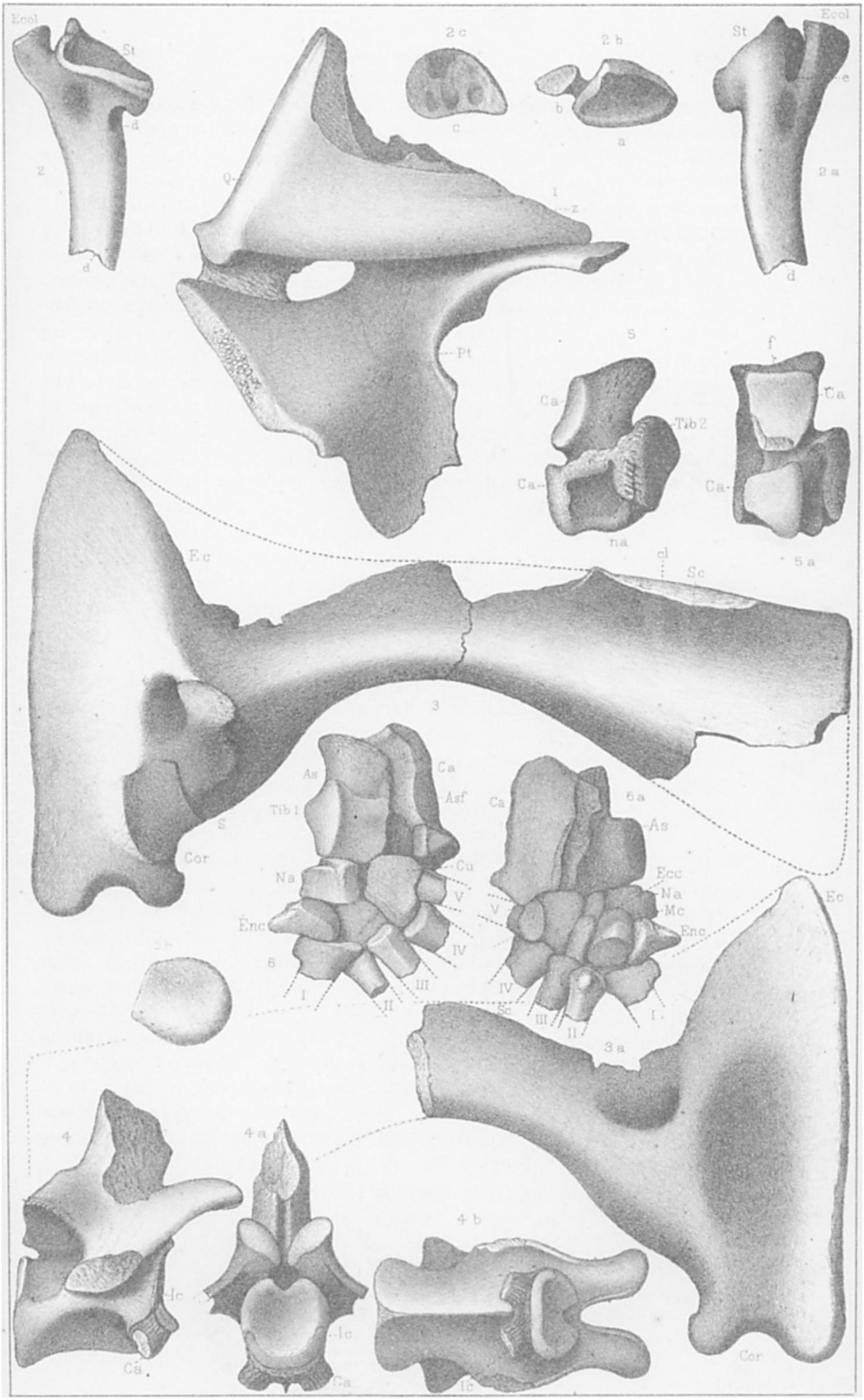
[1] Proceedings Zool. Society, London, 1869, p. 391.

[2] Monatsberichte der Academie Sciences, Berlin, 1868 (p. 592)—1870.

PLATE XXXVII.



Donkey Boys of Guaymas, Gulf of California.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Ca
4 b
Ic

same side displaced so as to be in plane of quadrate, and to be seen from inferior side. One-half natural size.

FIG. 2.—Columella auris of the individual of *Clepsydrops leptocephalus* represented in fig. 1; internal side. Fig. 2*a* external side; 2*b* proximal extremity; 2*c* distal extremity; *st*, head of stapes; *ecol*, epicolumella; *d*, distal articular surface, especially represented in fig. 2*c*. All figures are half natural size, excepting 2*c*, which is natural size.

FIG. 3.—Left half scapular arch of a Pelycosaurian, less clavicle and episternum, one-half natural size. *sc*, scapula; *cl*, facet for clavicle; *cor*, coracoid; *ec*, epicoracoid; *s*, open suture between coracoid and epicoracoid, indicating the immaturity of the animal.

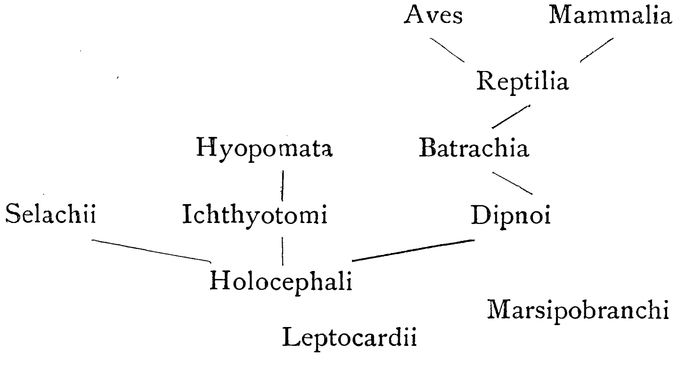
FIG. 4.—Dorsal vertebra of a species of Embolophorus, one-half natural size; right side; *a*, from front; *b*, from below. *ic*, intercentrum; *ca*, capitular rib articulation.

FIG. 5.—Astragalus of individual figured in fig. 4, one-half natural size; from below. *ca*, *ca*, facets for calcaneum; *na*, do, for navicular; *tib* 2, do, for bone of spur, or os tibiale. 5*a*, same bone from external or calcaneal border; *f*, fibular facet. 5*b*, same bone, proximal or fibular extremity.

FIG. 6.—Left posterior foot of *Clepsydrops natalis* Cope, superior side, and 6*a* inferior (plantar) side, two-thirds natural size. *as*, astragalus; *ca*, calcaneum; *na*, navicular bone; *cu*, cuboid; *enc*, *mc* and *ecc*, entocuneïform, mesocuneïform and ectocuneïform bones, respectively, I, II, III, IV, V, metatarsals. In this specimen the calcaneum is displaced, being turned backwards, so as to present its two astragalar facets (*asf*) anteriorly.

—*E. D. Cope.*

NOTE ON THE PHYLOGENY OF THE VERTEBRATA.—As my researches have now, as I believe, disclosed the ancestry of the mammals,[1] the birds,[2] the reptiles, and the true fishes,[3] or Hyopomata, I give the following phylogenetic diagram illustrating the same. This will only include the leading divisions. The special phylogenies of the Batrachia[4] and Reptilia,[5] and some of the Mammalia[6] have been already given.



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[1] AMERICAN NATURALIST, 1884, p. 1136.

[2] Proceedings Academy Philadelphia, 1867, 234.

[3] Proceedings American Philosoph. Society, 1884, p. 585.

[4] AMERICAN NATURALIST, 1884, p. 27.

[5] Proceedings American Association for the Advancement of Science, XIX, 1871, 233.

[6] Proceedings American Philosophical Society, 1882, 447; AMERICAN NATURALIST, 1884, p. 261 and 1121; Report U.S. Geol. Survey W. of 100th Mer., G. M. Wheeler, 1877, IV, II, p. 282.

The Mammalia have been traced to the Theromorphous reptiles by the Monotremata. The birds, some of them at least, appear to have been derived from the Dinosaurian reptiles. The reptiles in their primary representative order, the Theromorpha, have been probably derived from the Rhachitomous Batrachia. The Batrachia have originated from the sub-class of fishes, the Dipnoi,[1] though not from any known form. I have shown that the true fishes or Hyopomata have descended from an order of sharks,[1] the Ichthyotomi, which possess characters of the Dipnoi also. The origin of the sharks remains entirely obscure, as does also that of the Marsipobranchi. Dohrn[2] believes the latter class to have acquired its present characters by a process of degeneration. The origin of the Vertebrata is as yet entirely unknown, Kowalevsky deriving them from the Ascidia, and Semper from the Annelida.

It is now possible to determine the nature of the evolution of the greater number of the vertebrata, by resolving the difficult problem of distinguishing primitive from degenerate types. By degeneration I understand loss of parts and organs which subserve what would be usually called animal vitality, as distinguished from vegetative life. Preëminent among these must be regarded varied powers of movement, which give the greatest opportunity for the exhibition of intelligence. *Loss of parts without complementary development of other parts is the usual form of degeneration.*

Among the true fishes there are several examples of degeneration. Among Physostomi the marine eels (order Colocephali) exhibit this in their skulls and fins, the final degradation being reached by the deep-sea form, the Eurypharyngidæ. In Physoclysti, the group with abdominal ventral fins descended through the Hemibranchi to the very degraded type of the Lophobranchi. The group with pectoral ventral fins, especially the Percomorphi, present us with a degraded type of the Plectognathi. The descent commenced in the suborder Epilasmia (Chætodontidæ, Teuthyidæ, etc.).

The Batrachia are almost entirely a line of degradation. It is now quite safe to say that the Trachystomatous order (Sirenidæ) is a degraded, and not a primitive type.

The lines of Reptilia which terminated in the existing orders is a line of degradation. In comparison with the Theromorpha, the Crocodilia are degraded, and the Lacertilia are still more so. This latter order displays within itself the most remarkable number of degraded forms, as I can agree with Dr. Boulenger in calling them. Among snakes, the Typhlopidæ and their allies are a degraded type, but the order displays an ascending scale on the whole. Two extinct orders of Reptilia show ascending lines, viz., the Dinosauria and the Pterosauria, one or both of which terminated in the birds.

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[1] Proceedings American Philosoph. Society, 1884, p. 585.

[2] Der Ursprung der Wirbelthiere u. d. Princip des Functionwechsels. Von Anton Dohrn, Leipsic, 1875, p. 32.

The birds appear to form an ascending series, with few or no exceptions.

The line of the Mammalia is mainly ascending. Probable exceptions are the Edentata, the Sirenia and the Cetacea.—*E. D. Cope.*

THE PERMANENCE OF OCEAN BEDS.—Rev. O. Fisher publishes a letter in the *Geological Magazine* for September, in which he strongly supports the doctrine of the permanency of the ocean beds, closing as follows:

"Extensive changes of level seem to me to be the most difficult to account for of all the phenomena of geology. And the greater the changes, the greater the difficulty. The permanence of the respective areas seems therefore to involve less difficulty than their interchange. I published in *Nature* (Jan. 12, 1882), a suggestion to account for the origination of ocean basins. It is rather remarkable that the first and only allusion to it which I have seen has just now come from New Zealand in Dr. Haast's address at Canterbury College. Accepting Professor Darwin's theory that the moon broke away from the earth more than fifty million years ago, I think the ocean-basins may be the scar that was formed, and that the basement rocks of continents are fragments of the crust which had already solidified, and which were left behind. It has since occurred to me that the archæan rocks may be the veritable remains of it. I would refer to my published article for the details of the grounds on which I think this theory plausible. Dr. Haast uses rather too strong an expression in saying that I have attempted to prove it. It is probably incapable of proof, even if true."

SYSTEMATIC POSITION OF LEPIDODENDRON, SIGILLARIA AND STIGMARIA.—According to the Journal of the Royal Microscopical Society for August, B. Renault maintains his previous view as to the relationship of these fossil plants against the objections of Williamson and Hartog. He considers that those Sigillariæ which can be determined with certainty belong to the Gymnosperm type, while the species of Lepidophlois have the characteristics of Lycopodiaceæ. Stigmariæ must be regarded partly as rhizomes of Gymnosperms; the anterior portions must have had only leaves with monocentric vascular bundles, the anterior part, after the fall of the leaves, only adventitious roots with tricentric vascular bundles; while in the middle were both roots and leaves. This may serve to explain the conflicting descriptions of various writers.

GEOLOGICAL NOTES.—*General.*—The German Expedition has brought back the information that the island of South Georgia is composed of clay slate. This was not only found in situ, but taken from the débris brought down by the glaciers from the interior. Varieties of quartz were interspersed in some places, and the rock contained a little iron, insufficient to affect the needle. The mountains are from two to three thousand metres in height. ——Dr. Carl Ochsenius, of Marburg. discusses, in a recent number of the *Geological Magazine*, the origin of metalliferous deposits, and states that his conclusions, as evidenced by extracts from the Journal of the German Geological Society, August, 1881, agree substantially with those arrived at by Professor Joseph Le Conte, and put forth in the *American Journal of Science*, July 1883. To the words of the latter, "thus then subterranean waters of any kind, but especially alkaline, at any temperature, but mostly hot, circulating in any direction, but mainly upcoming, and in any kind of water may, but mainly in open fissures, by deposit form metalliferous veins." Dr. Ochsenius would add, "if they contain sufficient quantities of ores in solution," since many alkaline and saline springs and waters form no metalliferous deposits. He says, "Metalliferous deposits are in fact constituted of metallic particles, extracted from rocks by mother liquors, either with or without the operation of carbonic acid, and accumulated in fissures, cavities, or depressions. Mineral springs found in many metalliferous regions evidence the former activity of mother liquors."——Mr. W. T. Blanford states that it appears doubtful if the sedimentary formations of India can be accurately classified by means of the European subdivisions, and that he believes that the European classification can only be applied as an artificial scale or measure of comparison. He advocates the union of the Cambrian and Silurian, and considers the Devonian-Carboniferous-Permian as forming a second main division of Palæozoic. "Permian" does not occur in Asia. In the Indian Salt Range section, the upper series of the Carboniferous or Productus limestone series contains more Triassic forms than the Magnesian limestone of Europe. The Rhætic he considers as the upper member of the Triassic system, and advocates the Tertiary classification recommended by several German and Swiss geologists, viz., the union of the Oligocene with the Eocene, and the grouping of all the higher strata as Neogene or Mollasique.——The Permian (as commonly understood) has recently been roughly handled by the Rev. A. Irving, who shows that the Bunter and Mergel-Schiefer are Triassic, and are so regarded by German geologists, while the remainder of the so-called Permian, consisting of the marine Zechstein and the Rothliegende (a fresh water and land-formation with included eruptive rocks, parallel with the Zechstein) form the Dyas of the Germans. This Dyas may well be grouped with the Carboniferous.

Jurassic.—The stratigraphy of the middle Jurassic to the east of the Paris basin is elucidated by Wohlegemuth in a separate issue of the Academy of Sciences of Nancy. The middle and upper Bathonian, Callovian with *Ammonites athleta*, *anceps*, and *macrocephalus*, Oxfordian, Corallian with *Diceras arietinum* and

Cidaris florigemma, and the lower Kimmeridge or Astartian are described.

Cretaceous.—A neuropterous insect (*Æschna flindersiensis*), two trilobites and five molluscan species, including an Avicula and a Modiola, have been described by Dr. H. Woodward and W. H. Hudleston from the Cretaceous of Australia (*Geol. Mag.*, August).

Pleistocene.—Our knowledge of the glaciers of Europe is further increased in a paper by Edward Richter, in the zeitschrift of the German Alpine Club, entitled, "Observations on the Glaciers of the Eastern Alps, (I) the Obersalzbacher Glacier."——The Neues Jahrbuch für Mineralogie, Geol. and Palæon., 1884, notices the work of J. Partsch upon the ancient glaciers of the Carpathians and Central Germany, and that of A. Penck upon the glaciation of the German Alps, their causes, periodical retreat, and influence over the topography of the region covered by them. Penck divides the ice-period in the neighborhood of Innsbruck into six periods, concluding with the erosion of the Valley of the Inn, the formation of ravines on the terraces, and the deposition of moraines in them.——The same issue notices an account by Sr. Pereira Cabral of the superficial deposits of the basin of the Douro, around Oporto.

MINERALOGY.[1]

LEUCITE FROM LOWER CALIFORNIA.—The history of leucite is very interesting. Some thirty years ago Humboldt made the general statement that leucite occurred nowhere outside of Europe. Curiously enough, until within a few years this statement held good. In 1874, however, Vogelsang found it in an Asiatic basalt, and, in 1876, Zirkel announced its discovery in Wyoming Territory, U. S.

Although the leucite was invisible to the naked eye, Zirkel's discovery was regarded so important that the locality was named by the U. S. Geological Survey the *Leucite Hills.* An interesting commentary on the influence of modern science is furnished by a name so given.

Another extra-European locality for leucite is now announced by Von Chrustschoff[2] who finds it in a lava in the vicinity of the volcano "Cerro de las Virgines" in Lower California. The rock consists of an ash-gray ground-mass sprinkled with rounded spots of brownish-black obsidian or glass, and with light specks of leucite. These light specks are shown by a lens to have a rounded octagonal outline. Augite and olivine also occur porphyritically, and in the grondmass plagioclase, magnetite, nephe-

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[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Phila.

[2] Min. u. Petrograph. Mitth., 1884, VI, 160.